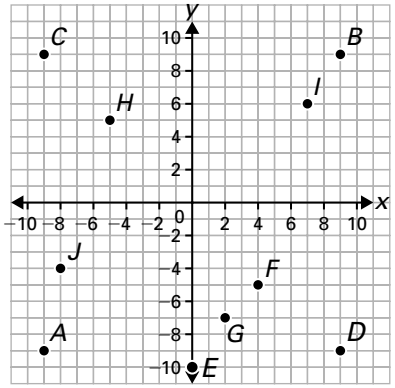
14. 24 cookies
15. (+45) + (+25) + (+15) + (−40) = (+45)

Chapter 7

7.1 Comparing Positions on a Grid

1. $B(2, 2)$, $C(-2, 3)$, $D(2, 0)$, $E(0, -3)$, $F(-1, -2)$
2. $A(7, -2)$, $B(3, 5)$, $C(-6, 8)$, $D(-4, 0)$, $E(0, 9)$, $F(-7, -5)$
3.

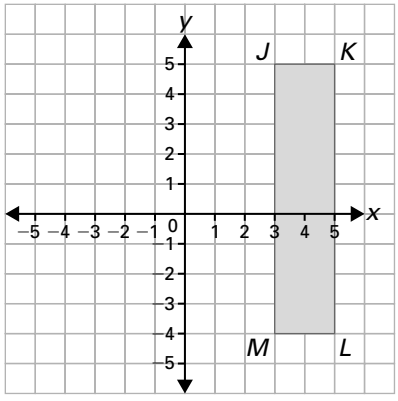


7.2 Translations

1. a) $A'(-2, 2)$ **b)** $B'(4, 5)$ **c)** $C'(-1, -1)$
2. $A'(2, -5)$, $B'(2, -1)$, $C'(6, -1)$, $D'(6, -5)$
3. $D'(2, -1)$, $E'(4, 2)$, $F'(6, 0)$
4. a) 4 units to the right
b) 2 units down and 2 units to the right

7.3 Reflections

1. $A'(1, 5)$, $B'(-3, 5)$, $C'(-3, 2)$, $D'(1, 2)$
2. a)

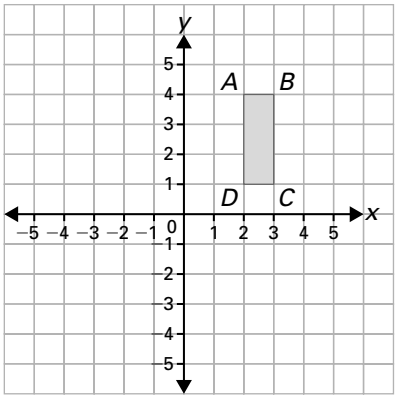


b) $J'(3, -5)$, $K'(5, -5)$, $L'(5, 4)$, $M'(3, 4)$
c) $J''(-3, 5)$, $K''(-5, 5)$, $L''(-5, -4)$, $M''(-3, -4)$
3. $Q'(2, 4)$, $R'(3, 1)$, $S'(5, 3)$

7.4 Rotations

1. a) A **b)** 90° **c)** ccw

2. a)



b) $A'(4, -2)$, $B'(4, -3)$, $C'(1, -3)$, $D'(1, -2)$
c) $A''(-4, 2)$, $B''(-4, 3)$, $C''(-1, 3)$, $D''(-1, 2)$
d) $A'''(-2, -4)$, $B'''(-3, -4)$, $C'''(-3, -1)$, $D'''(-2, -1)$

7.5 Congruence and Similarity

1. The shapes are congruent because they have the same shape and size.
2. a) A and C **b)** D and F
3. The second figures should have the same size and shape.
4. The second figures should have the same shape but a different size.
5. b) The matching sides are different, but the matching angles are the same.
6. b) The matching sides and the matching angles are the same.

7.6 Tessellations

1. a) There are two different orientations.
b) One orientation looks like a Z. The other orientation looks like a chair.
c) To transform the Z orientation into the chair orientation, you need to do a 90° cw rotation.

7.7 Communicating about Geometric Patterns

1. a) (1) Draw a right triangle with a 2 unit base and a 4 unit height. The right angle should be at the bottom left vertex. The triangle should point up. (2) On the same base, draw a second triangle that is similar to the first, but has a 1 unit base and a 2 unit height. Make the second triangle oriented the same way as the first triangle. (3) Line up the base of the second triangle with the base of the first triangle. (4) Translate this triangle to the right until its right angle is 2 units to the right of the bottom right units of the first triangle.

b) (1) Draw a vertical line that is 4 units long. From the bottom of the line, draw a second line to an imaginary point 3 units to the right and 1 unit up. From the end of the second line, draw a third line to an imaginary point 3 units up and 3 units to the left. The three lines will form a triangle. (2) Rotate the triangle 90° ccw around the top vertex. Repeat two more times.

2. a) (1) Draw a pentomino that has four blocks in a straight horizontal line, and one block sticking up at the end. Shade the pentomino grey. (2) Reflect the pentomino in its base. Leave the image white. (3) Reflect the first pentomino in a vertical line that touches the right-hand side of the pentomino. Leave the image white. (4) Reflect the white pentomino on the right-hand side in its base. Shade the image.

b) (1) Draw a small white square, about 1 cm by 1 cm. (2) Draw four congruent isosceles triangles around the square. Each side of the square will be the base for one triangle. The height of each triangle will be double the base. (3) Draw a larger square around the figure. The tip of each triangle should touch the centre of one side of the larger square. Make the line around the larger square thicker than the rest of the lines in the figure.

7.8 Investigating Pattern Blocks

1. B, C, D

2. 90°

3. a) No. Not all regular polygons can tessellate.

b) The pentagon does not tessellate.

c) You cannot divide 360° evenly by 108°, so the pentagon will not tessellate.

4. 60°

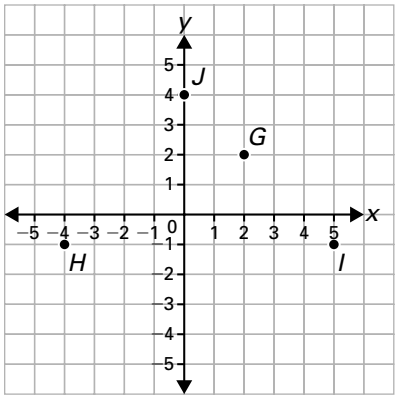
7.9 Tessellating Designs

When you have made your tiles, tessellate them by rotating, reflecting, and translating them. There should be no overlap or spaces between tiles in a tessellation.

Test Yourself

1. a) $A(3, 5)$, $B(-4, 1)$, $C(-3, 0)$, $D(-2, -5)$, $E(-1, 3)$, $F(0, 2)$

b)

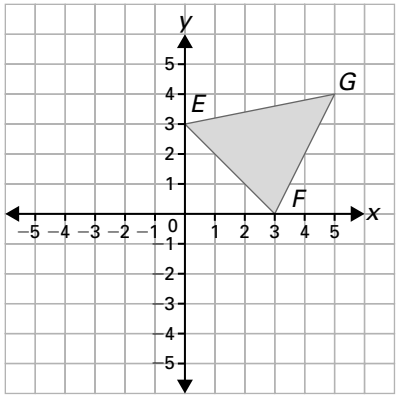


2. a) below **b)** above

3. a) right **b)** right

4. $A'(-5, 6)$, $B'(0, 6)$, $C'(0, 0)$, $D'(-5, 0)$

5. a)



b) $E'(-5, 0)$, $F'(-2, -3)$, $G'(0, 1)$

6. $H'(-3, -2)$, $I'(1, -2)$, $J'(4, 3)$, $K'(-5, 2)$

7. a) The coordinates of the image are $M'(2, 1)$, $N'(-1, 4)$, $L'(4, 4)$.

b) 180° ccw

8. a) A and C, B and G **b)** E and F

9. There are several different tessellations you could draw. Make sure there is no overlap or spaces between pentominoes.

10. (1) Draw a small equilateral triangle, each side about 1 cm long. The triangle is pointing up. (2) Draw three triangles around the first triangle. Each new triangle should be congruent with the first one, and should share one side with the first triangle. Shade the three new triangles grey. (3) Together, the four triangles you have drawn make up the shape of a larger triangle pointing down. Draw a line around this larger triangle, about 2 mm away from it so it has a white border. (4) In the centre of one side of the border, draw an equilateral triangle. It should have a base about half the length of the side of the

border, and be centred in the middle of the side. Shade it grey. (5) Draw two more grey triangles, one on each side of the white border.

Chapter 8

8.1 Exploring Pattern Representations

1. a) The missing values are 3, 6, 9, 12, and 15.
b) Start from 3. Add 3 to each value to get the next term value. An alterative rule could be: multipy the term number by 3.
2. a) The missing values are 1, 3, 4, 6, and 7.
b) Start from 1. Add 2, then add 1, then add 2, then add 1, and so on. An alternative rule could be: Add 0, 1, 1, 2, 2, and so on, to the term numbers to get the term values.
3. b) For the 10th term, there are 30 squares in total, and 15 shaded squares.

8.2 Using Variables to Write Pattern Rules

1. a) The number of shaded squares stays the same. The number of white squares changes.
b) Start with two shaded squares and one white square. Add one white square each time. An alternative rule could be: the total number is equal to 2 plus the term number.
c) $2 + b$, where b is the term number
2. a) The missing values are 2, 4, 6, 8, and 10.
b) The number of circles is equal to the term number multiplied by 2.
c) $2c$, where c is the figure number (also called the term number)
3. a) Omar sees that the number of squares stays the same: 2. He also sees that the number of triangles is equal to the term/figure number (n) plus 1, or $n + 1$. To find the total number of blocks, Omar adds the number of squares to the number of triangles and gets $2 + (n + 1)$.
b) Tynessa notices that the total number of blocks is equal to the term/figure number (n) plus 3. She gets $3 + n$.
4. a) $4 + s$ **b)** $4t$ **c)** $3c + 1$
5. a) n **b)** $3n$ **c)** $n + 3n$, or $4n$
6. a)

Figure number	1	2	3	4	5	…	10
Number of white squares	1	2	3	4	5		10
Number of shaded squares	8	10	12	14	16		26

b) $2n + 6$
c) $3s + 6$

8.3 Creating and Evaluating Expressions

1. a) 9, 10, 11, 12 **b)** 8, 16, 24, 32
c) 7, 6, 5, 4 **d)** 12, 6, 4, 3
e) 5, 7, 9, 11
2. a) 10 **b)** 18 **c)** 4 **d)** 6
e) 7 **f)** 12 **g)** 0 **h)** 9
3. a) \$17.50 **b)** \$1.75
4. a) \$21 **b)** \$102
5. a) \$65 **b)** \$35 **c)** \$20
6. a) $2c$ **b)** $10p + 2$ **c)** $35j - 10$
7. a) $20s + 5$ **b)** \$65 **c)** \$205
8. $3(x + 4) = 3(5 + 4) = 3(9) = 27$
9. a) $2p + 1$ **b)** 3 km **c)** 9 km

8.4 Solving Equations by Inspection

1. a) 5 **b)** 3 **c)** 2
d) 11 **e)** 2 **f)** 5
2. a) $4t - 8 = 4(2) - 8 = 0$; Ravi's solution is incorrect.
b) $t = 6$
3. a) $2t + 1$
b) $2t + 1 = 15$
c) $t = 7$
d) The figure number is $t = 10$.

8.5 Solving Equations by Systematic Trial

1. a)

Predict y.	Evaluate $y + 5$.	Is this the correct solution?
5	$5 + 5 = 10$	too low
10	$10 + 5 = 15$	too high
7	$7 + 5 = 12$	correct